



HARRIS COUNTY
ENGINEERING DEPARTMENT

**RULES, REGULATIONS AND REQUIRE-
MENTS RELATING TO THE APPROVAL
AND ACCEPTANCE OF IMPROVEMENTS
IN SUBDIVISIONS OR RE-SUBDIVISIONS**

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SECTION I

**ADMINISTRATIVE PROCEDURES IN THE REVIEW OF
SUBDIVISION PLATS AND CONSTRUCTION DRAWINGS**

A. Administrative Procedures in the Review of Subdivision Plats and Construction Drawings.

Note: For properties located within the extraterritorial jurisdiction (ETJ) of an incorporated city or town and subject to the jurisdiction of the Planning and Zoning Commission of that city or town, general subdivision design criteria and layout requirements as established by the applicable Commission will apply.

1. Preliminary plat and preliminary drawings, plan view only, to be submitted to Harris County Flood Control District and County Engineering Department for review and recommendations for changes to conform to requirements, if necessary.
2. Final plat shall be submitted complete with drawings and profiles showing line and grade of all streets, roads, bridges, sewers, ditches, utility easements and the course and location of existing pipelines or pipeline easements through such proposed subdivision. The design engineer shall furnish the proposed location of sewage disposal facilities and the source of water supply.
3. The final plat and drawings will be reviewed and the drawings either will be approved or recommendations made for further changes.
4. Upon approval of the plat and drawings by the County Engineer's Office, the final plat pursuant to plat recordation requirements will be submitted to Commissioners' Court for approval and will be delivered by Harris County personnel to the County Clerk's Office for recording in the Map Records of Harris County, Texas. The plat will be recorded by the County Clerk upon receipt of the required fee.

B. PLAT RECORDATION REQUIREMENTS

The original plat drawing submitted to the County Engineering Department prior to approval by Commissioners' Court and recordation in the Harris County Map Records is required to be accompanied by the following:

1. A title report, statement, or opinion, title policy or certificate or letter from a title company authorized to do business in the State of Texas or an attorney licensed as such in the State of Texas must be provided indicating ownership of the property, all liens against same, and any easements; said title information shall not have been executed more than sixty (60) days prior to the time the plat is received in the County Engineering Department.
2. A certificate from each tax collector of a political subdivision in which the property is located showing that all taxes owed to the County, School District, Utility District and/or any other political subdivision have been paid in full to date.
3. A letter to the County Engineer, signed by the County Health Officer, certifying that the subdivision's water and sewage treatment system has been approved in accordance with the requirements of the Texas Department of Health and existing laws.
4. A letter from the County Tax Assessor-Collector certifying that the name of the subdivision to be presented to the Commissioners' Court is not in conflict with any other subdivision previously recorded; this requirement applies to the first section only of multi-section subdivisions and is not applicable to street dedication plats designated by the street name.
5. A letter from the Harris County Flood Control District providing flood plain determination; if a portion of the plat lies within the 100-year flood plain, a letter is required from the developer/owner stating he is aware of the fact and will advise all prospective property owners of the fact.
6. Two sets of approved construction drawings are to be on file in the County Engineering Department at the time the plat is submitted to Commissioners' Court; however, in the event a tract of land is being platted to create reserves for the purposes of sale only and there are no immediate plans for construction of improvements on said reserves, then a note shall be placed on the face of the plat stating the following:

"site drainage drawings for the future development of this reserve must be approved by Harris County Flood Control District and Harris County Engineering Department."

7. A letter, statement or other instrument from the owner of any privately owned easement or fee strip within the plat boundaries where such easements or fee strips are proposed to be crossed by streets (either public or private) or public utility or drainage easements, stating that the owner of such easement or fee strip approves such crossing of the private easement or fee strip for the purposes intended and depicted upon the plat.
8. A bond with the owner of the subdivision named as Principal, this bond shall:
 - 8.1 be made payable to the County Judge and the Judge's successor(s) in office;
 - 8.2 be in the total amount of proposed paving and appurtenant drainage improvements in accordance with the following schedule:

<u>paving width</u>	<u>amount/linear foot</u>
28 feet	\$ 7.50
41 feet	11.00
single 25 feet	7.50
dual 25 feet	15.00
 - 8.3 be executed with sureties as may be approved by the court;
 - 8.4 be executed by a company authorized to do business as a surety in this state; and
 - 8.5 be conditioned that the roads and streets will be constructed in accordance with the specifications adopted by Commissioners' Court; in the event that all paving and drainage improvements have not been constructed and accepted within three years from the date of plat recordation, the owner of the subdivision shall provide Harris County with an equivalent substitute bond.
9. Additional information may be required by the County Engineering Department to clarify or support any of the aforementioned requirements.

C. PLAT DEDICATION STATEMENTS AND CERTIFICATES

OWNERS ACKNOWLEDGEMENT

EXAMPLE FORM

STATE OF TEXAS

COUNTY OF (Name of County in which plat is located)

We, (Name of owner or owners) acting by and through (name and title of officer) being officers of (Name of company or corporation), owner (or owners) hereinafter referred to as Owners (whether one or more) of the (number of acres) tract described in the above and foregoing map of (Name of subdivision or development), do hereby make and establish said subdivision and development plan of said property according to all lines, dedications, restrictions and notations on said maps or plat and hereby dedicate to the use of the public forever, all streets (except those streets designated as private streets), alleys, parks, water courses, drains, easements and public places shown thereon for the purposes and considerations therein expressed; and do hereby bind ourselves, our heirs, successors and assigns to warrant and forever defend the title to the land so dedicated.

FURTHER, Owners have dedicated and by these presents do dedicate to the use of the public for public utility purposes forever unobstructed aerial easements. The aerial easements shall extend horizontally an additional eleven feet, six inches (11' 6") for ten feet (10' 0") perimeter ground easements or five feet, six inches (5' 6") for sixteen feet (16' 0") perimeter ground easements, from a plane sixteen feet (16' 0") above ground level upward, located adjacent to and adjoining said public utility easements that are designated with aerial easements (U.E. & A.E.) as indicated and depicted hereon, whereby the aerial easement totals twenty one feet, six inches (21' 6") in width.

FURTHER, Owners have dedicated and by these presents do dedicate to the use of the public for public utility purposes forever unobstructed aerial easements. The aerial easements shall extend horizontally an additional ten feet (10' 0") for ten feet (10' 0") back-to-back ground easements or seven feet (7' 0") for sixteen feet (16' 0") back-to-back ground easements, from a plane sixteen feet (16' 0") above ground level upward, located adjacent to both sides and adjoining said public utility easements that are designated with aerial easements (U.E. & A.E.) as indicated and depicted hereon, whereby the aerial easement totals thirty feet (30' 0") in width.

FURTHER, Owners do hereby declare that all parcels of land designated as lots on this plat are originally intended for the construction of residential dwelling units thereon (or the placement of mobile home subdivision) and shall be restricted for same under the terms and conditions of such restrictions filed separately.

FURTHER, Owners do hereby covenant and agree that all of the property within the boundaries of this plat shall be restricted to prevent the drainage of any septic tanks into any public or private street, road or alley or any drainage ditch, either directly or indirectly.

FURTHER, Owners do hereby dedicate to the public a strip of land fifteen (15) feet wide on each side of the center line of any and all bayous, creeks, gullies, ravines, draws, sloughs or other natural drainage courses located in said plat, as easements for drainage purposes, giving the City of (Name of City), Harris County, or any other governmental agency, the right to enter upon said easement at any and all times for the purpose of construction and maintenance of drainage facilities and structures.

FURTHER, Owners do hereby covenant and agree that all of the property within the boundaries of this plat and adjacent to any drainage easement, ditch, gully, creek or natural drainage way shall hereby be restricted to keep such drainage ways and easements clear of fences, buildings, planting and other obstructions to the operations and maintenance of the drainage facility and that such abutting property shall not be permitted to drain directly into this easement except by means of an approved drainage structure.

ADDITIONAL PARAGRAPHS TO BE ADDED AS APPROPRIATE AND AS FOLLOWS:

(When streets within the plat are to be developed without concrete pavement, gutters and storm sewers the following paragraph is appropriate:)

FURTHER, Owners do hereby covenant and agree that all of the property within the boundaries of this plat shall be restricted to provide that drainage structures under private driveways shall have a net drainage opening area of sufficient size to permit the free flow of water without backwater and in no instance have a drainage opening of less than one and three quarters (1-3/4) square feet (18" diameter) with culverts or bridges to be provided for all private driveways or walkways crossing such drainage facilities.

(When plat indicates building setback lines and public utility easements are to be established in adjacent acreage owned by the subdivider the following paragraph is appropriate:)

FURTHER, Owners do hereby certify that we are the owners of all property immediately adjacent to the boundaries of the above and foregoing plat of (name of subdivision) where building setback lines or public utility easements are to be established outside the boundaries of the above and foregoing plat and do hereby make and establish all building setback lines and dedicate to the use of the public forever all public utility easements shown in said adjacent acreage.

(When private streets are established within the plat the following paragraph is appropriate:)

FURTHER, Owners do hereby covenant and agree that those streets located within the boundaries of this plat specifically noted as private streets, shall be hereby established and maintained as private streets by the owners, heirs, successors and assigns to property located within the boundaries of this plat and always available for the general use of said owners and to the public for firemen, fire fighting equipment, police and other emergency vehicles of whatever nature at all times and do hereby bind ourselves, our heirs, successors and assigns to warrant and forever defend the title to the land so designated and established as private streets.

FURTHER, Owners certify and covenant that they have complied with or will comply with the existing Harris County Road Law, Section 31-C as amended by Chapter 614, Acts of 1973, 63rd Legislature and all other regulations heretofore on file with the Harris County Engineer and adopted by the Commissioners' Court of Harris County.

(When the acknowledgment is attached to replat under the provisions of Section 212.014, Local Government Code, the following paragraph is appropriate:)

FURTHER, the Owners hereby certify that this replat does not attempt to alter, amend, or remove any covenants or restrictions; we further certify that no portion of the preceding plat was limited by deed restriction to residential use for not more than two (2) residential units per lot.

(When acknowledgement is attached to a replat under the provisions of Sections 212.015 or 212.016, Local Government Code, the following paragraph is appropriate:)

FURTHER, Owners certify that this replat does not attempt to alter, amend or remove any covenants or restrictions.

LIENHOLDERS ACKNOWLEDGEMENT AND SUBORDINATION STATEMENT

Note: Holders of all liens against the property being platted must execute the final plat or prepare separate instruments which shall be filed for record with the plat.

EXAMPLE FORM

I (or we), (Name of mortgagee or names of mortgagees), owner and holder (or owners and holders) of a lien (or liens) against the property described in the plat known as (name of plat), said lien (or liens) being evidenced by instrument of record in the Clerk's File No. _____ of the O.P.R.O.R.P. of Harris County, Texas, do hereby in all things subordinate our interest in said property to the purposes and effects of said plat and the dedications and restrictions shown herein to said plat and I (or we) hereby confirm that I am (or we are) the present owner (or owners) of said lien (or liens) and have not assigned the same nor any part thereof.

By: (Signature of Lienholder)
(Name to be printed)

Note: All lienholder signatures shall be acknowledged by a Notary Public.

NOTARY PUBLIC ACKNOWLEDGEMENT FOR ALL SIGNATURES

EXAMPLE FORM

STATE OF _____

COUNTY OF _____

BEFORE ME, the undersigned authority, on this day personally appeared (Names of persons signing the plat or instrument), (corporation titles if appropriate), known to me to be the persons whose names are subscribed to the foregoing instrument and acknowledged to me that they executed the same for the purposes and considerations therein expressed (add for corporations, "and in the capacity therein and herein stated, and as the act and deed of said corporation.")

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this (number) day of (month), (year).

(Signature of Notary Public)
Notary Public in and for the
State of

(Print Name)

(affix notary seal)

My Commission expires:

CERTIFICATE FOR SURVEYOR

EXAMPLE FORM

I, (name of surveyor), am authorized (or registered) under the laws of the State of Texas to practice the profession of surveying and hereby certify that the above subdivision is true and correct; was prepared from an actual survey of the property made under my supervision on the ground; that all boundary corners, angle points, points of curvature and other points of reference have been marked with iron (or other suitable permanent metal) pipes or rods having an outside diameter of not less than three quarter ($3/4$) inch and a length of not less than three (3) feet; and that the plat boundary corners have been tied to the nearest survey corner ("and to the City of Houston survey marker system" - to be added if the plat boundary is within a general area where such system has been developed).

(Signature of Surveyor)
(Print Name)

Texas Registration No. _____
(Affix Seal)

CERTIFICATE FOR PLANNING AND ZONING COMMISSION

EXAMPLE FORM

This is to certify that the Planning and Zoning Commission of the City of _____, Texas has approved this plat (or instrument when appropriate) and subdivision of (name of subdivision) in conformance with the laws of the State of Texas and the ordinances of the City of _____ as shown hereon and authorized the recording of this plat (or instrument when appropriate) this (number), day of (month), (year).

Signature of the Chairman
By: _____ or Vice Chairman
(Chairman or Vice Chairman)

Signature of Secretary
Director of Department of
By: Planning and Development
(Secretary)

(Affix Commission Seal)

CERTIFICATE FOR COUNTY ENGINEER FOR HARRIS COUNTY

EXAMPLE FORM

I, (name of engineer), County Engineer of Harris County, do hereby certify that the plat of this subdivision complies with all of the existing rules and regulations of this office as adopted by the Harris County Commissioners' Court; and further, that it complies or will comply with all of the laws included in the Harris County Road Law, also including Section 31-C as amended by Chapter 614, Acts of 1973, 63rd Legislature.

(Print Name)
County Engineer

CERTIFICATE FOR HARRIS COUNTY FLOOD CONTROL DISTRICT ENGINEER

EXAMPLE FORM

I, (name of director), Executive Director of Harris County Flood Control District, Harris County, Texas, do hereby certify that the plat of this subdivision complies with requirements for internal subdivision drainage as adopted by Commissioners' Court; however, no certification is hereby given as to the effect of drainage from this subdivision on the intercepting drainage artery or parent stream or on any other area or subdivision within the watershed.

(Print Name)
Executive Director

CERTIFICATE FOR HARRIS COUNTY COMMISSIONERS' COURT

EXAMPLE FORM

APPROVED by the Commissioners' Court of Harris County,
Texas, this _____ day of _____,
19____.

(Print Name)
Commissioner, Precinct One

(Print Name)
Commissioner, Precinct Two

(Print Name)
County Judge

(Print Name)
Commissioner, Precinct Three

(Print Name)
Commissioner, Precinct Four

COUNTY CLERK FILING ACKNOWLEDGEMENT STATEMENT

EXAMPLE FORM

I, (name of County Clerk), Clerk of the County Court of Harris County, do hereby certify that the within instrument with its certificate of authentication was filed for registration in my office on (date and month), (year), at (time) o'clock (a.m. or p.m.), and duly recorded on (date and month), (year), at (time) o'clock (a.m. or p.m.), and at Film Code No. _____ of the Map Records of Harris County for said county.

Witness my hand and seal of office, at Houston, the day and date last above written.

(Print Clerk's Name)

Clerk of the County Court
of Harris County, Texas

By: _____
Deputy

VACATION OF SUBDIVISION PLAT

EXAMPLE FORM

STATE OF TEXAS

COUNTY OF HARRIS

KNOW ALL MEN BY THESE PRESENTS:

I (or we), (Name of owner or owners if individuals) or (Name of President and Secretary or authorized trust officer of a company or corporation), being the sole owner (owners) and proprietor of the following described property in (Name of City and County), Texas, to-wit:

(Provide legal description of the property including, but not limited to, the acreage, the name of the recorded subdivision, the name of the Survey and Abstract Number, and recording references.)

do hereby desire and declare that said plat, subdivision and dedication thereon be vacated and cancelled so as to convert all of said platted property to acreage tracts as same existed before such property was platted, subdivided and recorded.

(At this point any rights-of-way, easements or any other feature established in the subdivision being vacated which will not be cancelled as a result of this vacation action should be described.)

E. AMENDING PLAT CERTIFICATES

Note: The following certificates and acknowledgements are requirements to be placed upon the face of all amending plats.

I, (name of surveyor), hereby certify that the following corrections were necessary to eliminate errors which appear on the plat of volume (number), page (number), of the Harris County Map Records (or when applicable, film code numbers of the Map Records of Harris County, Texas):

(Provide brief explanation of corrections required)

(Signature of surveyor)
(Print name)

Texas Registration No. _____

(Affix Seal)

I (we), (name(s) or owner(s)), owner(s) of the property directly affected by this amending plat, being lot(s) _____ out of the block(s) _____ as indicted hereon, do hereby consent to this amending plat for the purposes herein expressed.

(Signature of Owner(s))
(Print Name)

Note: All owners signatures shall be acknowledged by a Notary Public.

APPROVED BY THE (Name of City) PLANNING AND ZONING COMMISSION on (date, month and year).

(Signature of the Chairman or Vice Chairman)
(Print Name)

(Signature of Secretary-Director Department of Planning & Development)
(Print Name)

(Affix Commission Seal)

APPROVED BY THE HARRIS COUNTY FLOOD CONTROL DISTRICT on (date,
month and year).

(Print Name)
Executive Director

APPROVED BY THE HARRIS COUNTY ENGINEER ON (date, month and year).

(Print Name)
County Engineer

APPROVED BY THE HARRIS COUNTY COMMISSIONERS' COURT on (date,
month and year).

(Print Name)
Commissioner, Precinct One

(Print Name)
Commissioner, Precinct Two

(Print Name)
County Judge

(Print Name)
Commissioner, Precinct Three

(Print Name)
Commissioner, Precinct Four

SECTION II

DRAWING REQUIREMENTS

A. GENERAL

1. The Professional Engineer, registered in the State of Texas, is required to seal, date and sign each sheet of the drawings in accordance with rules set forth by the Texas State Board of Registration for Professional Engineers. The seal must reproduce on all sheets.

B. CONSTRUCTION PLANS

1. A bench mark elevation based on U.S.G.S. datum, 1973 adjustment and description is required on each sheet.
2. Indicate right-of-way widths, pavement widths and thickness, type of roadway materials, curbs, intersection radii, curve data, stationing, existing and proposed utilities - type, location, etc. on each plan sheet.
3. Stationing must run from left to right except for short streets or lines originating from a major intersection where the full length can be shown on one sheet.
4. A North arrow is required on all sheets and should be generally oriented either upward or to the right.
5. Identify all adjacent property, show all lot lines, property lines and rights-of-way lines, etc.
6. A cover sheet shall be required for all projects involving three or more plan and profile sheets. All plan sheet numbers should be included on the cover sheet or area map. A vicinity map should always be included to show the project location.
7. If a roadway exists where drawings are being prepared to improve or construct new pavement or to construct a utility, this roadway should be labeled as to its existing width, type of surfacing and base thickness if available without destruction of pavement.
8. A copy of the final plat should be included with the final drawings when the design drawings are submitted for final approval.
9. Drawings submitted for Harris County approval shall be on mylar or linen.
10. Do not place match lines in intersections.

11. All utility lines four inches (4") in diameter or larger within the right-of-way or construction easement should be shown in the profile view. All utility lines, regardless of size, should be shown in the plan view. Resolve all known conflicts of proposed utilities with existing utilities.
12. Show flow line elevations and direction of flow of all existing ditches.
13. Show natural ground profiles at each right-of-way or easement line.
 - 13.1 Center line profiles of natural ground will be satisfactory for rights-of-way or easements except where there is a difference of 0.50 feet or more from one right-of-way or easement line to the other; in which case, dual profiles will be required.
14. Drawings for street and/or public improvements shall be standard 23" x 36" Federal Aid Sheets or 24" x 36" overall dimensions for all design in rights-of-way or easements. Site drawings may be allowed on larger sheets when practical.
15. Details of special structures not covered by approved standard drawings, such as stream and gully crossings, special manholes, etc., should be drawn with the horizontal and vertical scales equal to each other.
16. Drawings shall be drawn to accurate scale, showing proposed pavement typical cross sections and details, lines and grades, and all existing topography within the street rights-of-way; and at intersections, the cross street shall be shown at sufficient distance in each direction along the cross street for designing adequate street crossings.
17. Grades should be labeled for the top of the curb except at railroad crossings. Gutter elevation shall be shown at Railroad Crossings. Center line elevations are acceptable only on streets without curb and gutters.
18. Curb return elevations for turnouts shall be shown in the profile.
19. Station all esplanade noses, both existing and proposed.
20. The design of both roadways is required on all pavement sections with an esplanade.

21. Station all P.C.'s, P.T.'s, radius returns and grade change P.I.'s in the plan view. Station all radius returns and grade change P.I.'s in the profile with their respective elevations.
22. The standard scales permitted for plans and profiles of paving and utility drawings are as follows:
 - 22.1 Major thoroughfares or special intersections/situations:
 $1" = 2'$ Vertical; $1" = 20'$ Horizontal
 - 22.2 Minor streets:
 $1" = 5'$ Vertical; $1" = 50'$ Horizontal
or
 $1" = 4'$ Vertical; $1" = 40'$ Horizontal
(for reconstruction on minor streets, a larger scale may be required to show detail)
23. The above scales of paragraph 22.1 are the minimum, and larger scales may be used to show details of construction.
24. Deviations to these scales can only be allowed with the specific approval of the County Engineer.
25. In addition to the plan and profile sheets described above, where applicable, each set of construction drawings shall contain a separate key paving and drainage drawing and a key utility drawing indexing specific plan and profile sheets.
26. It is preferable that key overall layouts be drawn at a scale of $1" = 100'$ or $1" = 200'$. Smaller scale may be used where appropriate for the project with prior approval.
27. Drafting principals, conventions, techniques shall be those generally recognized in contemporary literature, and in common practice in the engineering practice.
28. Graphic standards shall be in accordance with those currently required by the City of Houston.

SECTION III

DRAINAGE DESIGN REQUIREMENTS

DRAINAGE DESIGN REQUIREMENTS

- A. General: All storm sewers and appurtenant construction shall conform to the City of Houston Department of Public Works "Specifications for Sewer Construction", Form E-14-62, City of Houston Drawing Nos. 529-S-1, 530-S-1, 530-S-2 and all subsequent revisions. Any storm sewers and sanitary sewers which are located underneath or within one (1) foot of the paving section shall be bedded and backfilled with cement stabilized sand which meets or exceeds minimum 100 psi and contains not less than 1-1/2 sack cement per ton of sand. Backfill with cement sand to within one (1) foot of subgrade. Water lines to be bedded and backfilled in accordance with City of Houston Technical Specifications. See City of Houston Water Engineering Drawings 203 and 204.

Trench excavation shall comply with all provisions contained in Article 1015Q (Texas Civil Statutes, Annotated).

B. Requirements Unique to Major Thoroughfares

1. The high point of top of curb should be at or not more than 3" below finished grade and the gutter to slope to inlet on minimum 0.25% grade.
2. Paving elevations, grades and storm sewer design shall be such that not more than one traffic lane of water shall pond in the low gutter of curbed sections during a 25 year event rainfall.
3. Storm sewers shall be designed from the following criteria:
 - 3.1 A minimum 150' wide strip each side of and adjacent to the proposed road right-of-way shall be considered an impervious surface contributing runoff to the storm sewer and an in depth study of runoff and characteristics shall be made of all land areas contributing runoff to the roadway. The contributing runoff from all areas outside the two 150' wide strips shall be computed according to the existing characteristics utilizing City of Houston 3 year frequency curve.

C. 1. General Design Requirements

- 1.1 The City of Houston Rainfall Runoff Curves, Three-Year Frequency, Drawing No. S-506, shall be used as the criteria for determining runoff and discharge.

1.2 A typical impervious area analysis must be submitted for the proposed development in instances where imperviousness exceeds the standards for the specific type of development established by Drawing No. S-506. (i.e. 75% imperviousness for single-family plat with 40-foot lots.)

2. Typical Curve Usage:

2.1 Curve 4 - Single-Family Residential;

2.2 Curve 3 - Multi-Family Residential and Semi-Commercial;

2.3 Curve 2 - Commercial and all unrestricted developments;

2.4 Curve 1 - Very high density office-warehouse development.

3. Runoff originating outside the development's limit, but entering the development's system, shall be designed at 1 cfs/1 acre or at an intensity as may be determined by complete study of area using the Harris County Flood Control District Curves. In the event a swale ditch is needed to intercept runoff and direct it to the proper storm sewer system or Flood Control Ditch, utilize the following guidelines:

3.1 Provide Contour Map showing area to be drained along with calculations to support ditch size and grades.

3.2 Locate in an easement sufficient in width to allow for proper maintenance operations.

4. Provide a Contour Map and Drainage Area Map for all areas which are to be drained by the proposed drainage system.

5. Submit drainage calculations based upon curves to support line sizes and slopes. The "n" coefficient in Manning's Formula shall be 0.013 for concrete pipe and 0.024 for corrugated metal pipe.

6. A graphical plot and calculations of the hydraulic gradient shall be furnished by the design engineer. The hydraulic gradient is to be based upon the water surface in the outfall ditch or channel for a 25-year storm and discharges developed from City curves through the proposed system maintaining a hydraulic gradient

below gutter elevation in all instances. For approved streets with ditch sections, the hydraulic gradient shall be 0.5' below the edge of pavement or natural ground elevation, whichever is lower.

7. The minimum size for storm sewers shall be twenty-four inches (24") inside diameter pipe or equivalent cross section area, and shall be designed to have a minimum velocity of three feet per second (3'/sec) when flowing full. The minimum size for storm sewer inlet leads shall be twenty-four inches (24") inside diameter or equivalent cross section area.
8. For all storm sewers having a cross sectional area equivalent to a forty-two inch (42") inside diameter pipe or larger, soil borings with logs shall be made along the alignment of the storm sewer at intervals not to exceed five-hundred feet (500') and to a depth not less than three feet (3') below the flowline of the sewer. The required bedding of the storm sewer as determined from these soil borings shall be shown in the profile of each respective storm sewer. When the trench is opened, if in the judgement of the Design Engineer, conditions differ from the design basis, he may authorize changes in the bedding indicated on the drawings. Such changes shall be shown on the record drawings.
9. Open Ditch:
 - 9.1 The rainfall runoff criteria shall be determined based on the projected land use and the City design curves.
 - 9.2 The minimum preferred unlined or unimproved roadside ditch section should have a side slope no steeper than three (3) horizontal to one (1) vertical configuration. Steeper slopes will be allowed when the existing right-of-way is limited or other construction features dictate the design. The steepest slope shall not exceed two (2) horizontal to one (1) vertical.
 - 9.3 The minimum bottom width for roadside ditches should be two feet (2') unless design hydraulics will support a narrower or vee ditch configuration.
 - 9.4 The "n" coefficient in Manning's Formula for ditch calculations shall be based on the surface treatment of the completed channel section with 0.040 as the minimum coefficient for unlined dirt ditches.

- 9.5 The minimum grade or slope of roadside ditches shall be 0.10 percent.
- 9.6 The minimum depth of roadside ditches shall be eighteen inches (18") from the top of the pavement, and the maximum depth shall be not more than four feet (4'). Extreme conditions may warrant a deeper ditch, specific approval of same must be obtained from the County Engineer.
- 9.7 A graphic plot and calculations of the hydraulic gradient employing culvert design parameters shall be shown for each drainage ditch section and shall be 0.50' below the edge of pavement or natural ground elevation, whichever is lower.
- 9.8 The minimum size culvert shall have a cross section area equal to or greater than an eighteen-inch (18") inside diameter pipe. Pipe culverts shall conform to ASTM Specification C-76, Class III, for reinforced concrete pipe. All proposed and reasonably expected future culverts shall be included in the hydraulic profile. The size of culvert used shall not create an additional head loss of more than 0.20' greater than the normal water surface profile prior to placement of the culvert. All driveways to have culverts, no paved dips for driveways.
- 9.9 Erosion control methods acceptable to the County Engineer shall be utilized in ditch designs where the velocities of flow are calculated to be greater than five feet (5') per second or where soil conditions indicate their need.
- 9.10 Outfalls from storm sewers and ditches shall enter at the grade of the outfall ditch or in a manner acceptable to the Harris County Flood Control District and Harris County Engineer. If necessary, drop type outfall structures shall be used to prevent erosion.
- 9.11 The shoulder widths for roadways shall be a minimum of 6 feet (6') from the edge of pavement to the adjacent edge of ditch bank.
- 9.12 The minimum distance between the right-of-way line and adjacent edge of the bank of ditch shall be two feet (2').
- 9.13 Storm water discharging from a ditch into a storm sewer system must be received by use of an approved structure.

9.14 All side lot or back lot drainage facilities shall be underground storm sewers constructed in accordance with the specifications herein. Individual lot drainage shall be exempted from this requirement.

10. Major drainage ways through a subdivision shall be designed and constructed in the manner prescribed by the Harris County Flood Control District.
11. If the developer proposes to construct major structures, such as box culverts or bridges across drainage channels, such structures shall conform to drawings and specifications of the Flood Control District as well as the County Engineer. See Section V.A-1, Structures.

D. Materials:

1. All storm sewers shall be constructed with reinforced concrete pipe, either precast pipe, box conduits or cast in place pipe. The use of corrugated galvanized metal pipe, or other approved equal, may be used only at the storm sewer outfall into unlined channels. The length of the outfall shall be determined on an individual basis as dictated by the construction requirements.
2. All storm sewer construction shall conform to the City of Houston, Department of Public Works "Specifications for Sewer Construction", Form E-14-62, City of Houston Drawing Nos. 529-S-1, 530-S-1, 530-S-2 and all subsequent revisions.

E. Alignments:

1. All cast in place concrete storm sewers shall follow the alignment of the right-of-way or easement.
2. All precast concrete pipe storm sewers should be designed in a straight line and tops of pipes should be matched at all pipe size changes.
3. All storm sewer inlet leads shall be designed in a straight line.
4. Storm sewers shall be located in public street rights-of-way or in easements.

5. In all easements restricted to storm sewers, the pipe shall be centered within the limits of the easement. Minimum width of easement shall be 20 feet (20'). In the event of extreme depth and/or large sewers, additional width may be required to allow for proper maintenance operations. Class AA bedding shall be provided in accordance with City of Houston E-14-62.
6. For storm sewers located in easements adjacent to public street rights-of-way, the minimum width of the easement shall be ten feet (10'). The minimum width shall be increased for larger pipe or conduit with the requirement that a minimum distance of five feet (5') shall be maintained from the easement line to the outside edge of the sewer, and a minimum distance of two feet (2') shall be maintained from the right-of-way line to the outside edge of the sewer pipe or conduit.

F. Manholes shall be located at:

1. All pipe size or cross section changes. Tops of pipe should be matched.
2. All pipe sewer intersections or P.I.'s.
3. All pipe sewer grade changes (precast pipe only).
4. All street intersections.
5. A maximum of seven hundred feet (700') measured along the center line of the pipe sewer
6. All inlet lead intersections with the pipe sewer where precast concrete pipe sewers are designed. Manholes are not required where inlet leads intersect a monolithic concrete storm sewer; however, manholes may be required as necessary to provide access for adequate maintenance of lead lines.

G. Inlets:

1. Shall be located at all low points on gutter gradient.
2. Inlets must be spaced to serve the runoff calculated from City curves. Curb inlets shall be spaced so that the maximum travel distance of water in the gutter will not exceed seven-hundred feet (700') one way for residential streets and three-hundred feet (300') one way on major thoroughfares and streets within commercial developments. It is preferable that curb inlets be located on intersecting side streets instead

of major thoroughfares on all original designs or developments. Special conditions warranting other locations of curb inlets shall be determined on a case by case basis by the County Engineer. Type "BB" Inlet or equal is to be used as a curb inlet on curbed streets. The capacity of a Type "BB" Inlet is 5 cfs and valley gutters are not permitted on public streets (public alleys exempted) on all original designs or developments. All inlets are to be constructed of brick masonry, cast concrete in place, or may be precast as approved by the County Engineer. Minimum lead size is 24".

3. Certain instances may bring about the need for utilization of inlet types other than the standard "BB" and will be used only after receiving approval of the County Engineer.

SECTION IV

PAVING DESIGN REQUIREMENTS

PAVING DESIGN REQUIREMENTS

General:

Both concrete pavement, flexible base pavement and the subgrade for both shall be designed and constructed in accordance with applicable Harris County Specifications for the Construction of Roads and Bridges (April, 1988). Where conflicts occur, the requirements set forth in these guidelines shall supersede.

Treatment of the subgrade shall be determined by a certified geotechnical engineer, accredited by the American Association for Laboratory Accreditation (A2LA). Recommendation(s) of the certified geotechnical engineer shall be adhered to unless the specified treatment is not consistent with conditions found during construction, at which time the geotechnical engineer will be required to make adjustments, as needed.

The following design requirements are applicable to all pavement under Harris County's jurisdiction that is to be constructed by the development community.

A. Typical Sections

1. Roadway cross sections, curb and gutter streets, shall conform to "Geometric Design Guidelines for Subdivision Streets, Harris County and City of Houston" as adopted by Commissioners' Court on October 1, 1985 and any subsequent revisions thereto.
2. Roadway cross sections for streets with ditches:
 - 2.1 Major thoroughfares shall be two (2) divided traffic lanes of twenty-four feet (24') edge to edge for each lane with minimum six foot (6') shoulder on each side.
 - 2.2 Minimum width of the paving section for low density single family developments shall be twenty two feet (22') with a six foot (6') shoulder on each side. Thickness, cement content and reinforcement requirements, see IV.B-1 (below). All other roadways shall be designed in such a manner that the combined width of the paving and the shoulders is equal to or greater than the width requirements for a curb and gutter street with identical land use being planned for adjacent property. Thickness and reinforcement for such streets shall be seven inches (7") thick and reinforced with #4 (1/2") bars. In no case shall minimum width of roadway be less than 28 feet (28') edge to edge of paving in any development

with the exception of Low Density Single Family Residential Subdivisions.

B. Minimum Thickness and Reinforcement Requirements for Concrete Pavement

1. For pavement less than thirty feet (30') F/F of curb, the concrete pavement is to be a minimum of six inch (6") uniform thickness, 5.0 sacks of Portland Cement, reinforced with #4 (1/2") deformed steel reinforcing bars spaced a maximum of 24" center to center each way.
2. Pavement thickness and reinforcement for major thoroughfare streets shall be designed in accordance with item 5, below, and shall have minimum width of twenty-four feet (24') F/F of curb for each one-half of the roadway section. The concrete pavement shall be a minimum of 8" uniform thickness, 5.0 sacks of Portland Cement, reinforced with #4 (1/2") deformed steel reinforcing bars spaced a maximum of 24" center to center each way.
3. For all other curb and gutter streets, the concrete pavement shall be a minimum of 7" uniform thickness, 5.0 sacks of Portland Cement, reinforced with #4 (1/2") deformed steel reinforcing bars spaced 24" center to center each way.
4. All reinforcing steel shall conform to Harris County Specifications Item 440.
5. In the event special circumstances and engineering analysis indicate the need of a stronger pavement than those listed above, pavement thickness and reinforcement shall be supported by design analysis. Design method and loading requirements shall conform to current "Specifications for the Construction of Roads and Bridges within Harris County, Texas".

C. Flexible Base Pavement with Ditches

1. Minimum thicknesses are as follows:
 - 1.1 6" subgrade as specified in the applicable Harris County specification item.
 - 1.2 8" of compacted base; crushed limestone, or approved equal(s).
 - 1.3 1-1/2" of Hot Mix Hot Laid Asphaltic Concrete Pavement.
2. Flexible Base Pavement for all developments other than Low Density Single Family residential shall be supported by design analysis conducted by a certified

geotechnical engineer. Recommendation of the geotechnical engineer shall be strictly followed. Design method and loading requirements shall conform to current "Specifications for the Construction of Roads and Bridges within Harris County, Texas".

3. Pavement Width:

3.1 Minimum shall be twenty two feet (22') edge to edge of paving with a six foot (6') shoulder on each side. (Low Density Single Family Residential).

3.2 Roadway widths shall be designed in accordance with criteria set forth in "Roadway Cross Sections for Streets with Ditches". See Section IV-A.

3.3 Ditch sections will follow requirements given under drainage.

D. Grade Design Requirements

1. Curb and Gutter Sections:

1.1 Minimum gradient on gutter shall be 0.25 percent.

1.2 Maximum drop of grade tangents from opposite directions to a common inlet shall be 1.5 feet.

1.3 The maximum allowable curb run to an inlet shall be seven hundred feet (700') one way for residential streets and three hundred feet (300') one way for major thoroughfares or streets within commercial developments.

1.4 Maximum cut from finished grade at property line to top of curb shall be 1.75 feet.

1.5 Minimum one percent (1%) fall around intersection turnout for a minimum radius of twenty-five feet (25'). Grade for larger radius shall be determined on an individual basis.

1.6 Vertical curves shall be installed when algebraic difference in grades exceeds one percent (1%). Elevations shall be shown at ten-foot (10') intervals through vertical curves.

1.7 Radius of cul-de-sac-pavement:

7.1 Residential shall be a minimum of forty two feet (42') to face of curb.

7.2 Commercial shall be a minimum of fifty feet (50') to face of curb.

- 1.8 When a curb and gutter intersects a drainage ditch, the grade of gutter shall be above the designed water surface of the ditch in accordance with requirements of the Harris County Flood Control District.
- 1.9 Minimum grade for cul-de-sac shall be 0.60 percent along gutter.
- 1.10 Major thoroughfares shall be superelevated in accordance with sound engineering practice whenever the center line radius of lanes or rights-of-way are less than 2,000 feet.
- 1.11 For boulevard sections, the amount of cross slope over the pavement section should be shown on the drawings. The usual cross slope is one-fourth inch (1/4") per foot from curb line to curb line, and one-eighth-inch (1/8") per foot for left turn lanes and esplanade crossovers.
 - 11.1 For streets with single paving sections, the amount of cross slope over the pavement section shall be in accordance with Harris County drawing S/D-1, "Subdivision Pavement Standards".
- 1.12 A minimum gradient of 0.40 percent around the longest radius is required on an L-type street intersection.
- 1.13 When meeting an existing curbed street, top-of-curb grades should be laid to meet an elevation six inches (6") above the existing gutter, except at inlets.
- 1.14 Grades should be laid to match the top of the curb of an existing inlet.
- 1.15 Vertical curves should be labeled every ten feet (10'). Maintain minimum of 0.03 feet on ten-foot (10') intervals by altering the calculated elevations.
- 1.16 When the curb grades are not laid below the natural ground, fill lines shall be shown on the drawings and shall be of a sufficient height to insure a minimum of three-eighths-inch (3/8") per

foot transverse slope toward the curb from the property line between a point two feet (2') outside right-of-way and top of the curb. If this type fill is required and the pavement is adjacent to a non-participating property owner, fill easements from this property owner shall be obtained, filed, and a copy of the easements shall accompany the final drawings.

- 1.17 Grades should be labeled for all top of curbs except at railroad crossings. Center line grades are acceptable for approved streets with ditch sections only.
- 1.18 Gutter elevations are required for vertical curves where a railroad track is being crossed.
- 1.19 The gradient for tangents to vertical curves at railroad crossings shall be a maximum of 3.5 percent and 4.0 percent at bridges, box culverts and pedestrian tunnels.
- 1.20 Where railroad crossings are not at right angles to the pavement slab, vertical curves should be calculated for each curb line and should be posted at ten-foot (10') intervals in the profile.
- 1.21 Valley Gutters are not permitted.
2. Roadway Sections with Ditches:
 - 2.1 Minimum grade on ditches - 0.10 percent
 - 2.2 Ditch design to handle runoff as determined in Section III.C-10, "Drainage Design Requirements".
 - 2.3 Side slopes of ditch not steeper than 3:1 for unimproved ditches. Steeper slopes may be allowed when existing right-of-way is limited or other construction features dictate the design.
 - 2.4 Culverts shall be designed to carry ditch discharge, but not less than eighteen-inch (18") pipe and all driveways shall have culverts or bridges; no paved dips for driveways.

E. Inlets:

1. Type "BB" inlets or equal shall be used on all curb and gutter sections unless certain conditions exist which warrant the use of other standard inlets. See Section III.

2. Inlets at all low points on gutter gradient.
3. Inlets should be placed away from the major thoroughfare and on the side streets at street intersections.
4. Attempt to keep the proposed inlets away from the esplanade openings and out of major thoroughfare intersections. Also attempt to keep inlets out of future driveways.
5. Inlets shall be placed at the end of pavement in order to eliminate drainage from the pavement gutter into a ditch when the drainage is toward the end of the pavement or from the ditch to the pavement gutter.
6. When meeting a ditch, storm water must be received by use of an approved structure. See Section III.C-9.13.

F. Curbs, Sidewalks and Driveways

1. Curbs:

- 1.1 Standard curb height is six inches (6"), constructed in accordance with Harris County Drawing S/D-1, "Subdivision Pavement Standards".
- 1.2 Curbs are to be decreased from six inches (6") to zero inches (0") in ten feet (10') when approaching railroad tracks or existing roadway without curbs.

2. Sidewalks and Driveways

- 2.1 Sidewalks and driveways shall conform to Regulations of Harris County for the construction of driveways and culverts on County Easements and Rights-of-Way.
- 2.2 Sidewalk Construction in Esplanade: Concrete sidewalk six inches (6") thick with surface colored black shall be constructed in all esplanades when curbs are ten feet (10') and less in width from face to face of curbs. This shall apply especially for all esplanade noses. Sidewalks constructed in esplanades of asphaltic surfaced streets shall not be colored.

G. Requirements for Intersections, Turnouts, Transitions and Thoroughfares

1. At a "T" intersection with a street that has not been improved to its ultimate width, concrete pavement should be stopped either at the right-of-way line or

the end of the curb return, whichever would require less concrete removal at a future date.

2. When roadway turnouts are placed where an existing cross street intersects, the turnout should be sized to fit the ultimate pavement width and then transitioned to the existing roadway utilizing same materials as exist on the existing road/street. Length of transition shall conform to "Geometric Guidelines for Subdivision Streets, Harris County and City of Houston", and any subsequent revisions thereto as adopted by Commissioners' Court on October 1, 1985.
3. When paving only one (1) roadway of a proposed two (2) roadway thoroughfare, all left turn lanes and esplanade crossovers in the one half (1/2) of the right-of-way where the roadway is being paved shall be paved to center line of the street right-of-way.
4. When meeting an existing concrete street at right angles, the existing street shall be saw cut in a V-shape extending from the curb returns to a point where the centerline of the proposed pavement intersects the quarter point of the existing street in order to create a crowned intersection. In the event that this construction causes excessively rough riding condition making adequate control of the vehicle difficult, a special design will be considered to eliminate this condition.
5. All traffic signs, striping, channelization devices, etc. must comply with the Manual on Uniform Traffic Control Devices.

H. Miscellaneous Paving Requirements

1. If driveways are to be constructed with the paving project, show locations on the drawings and post a center line for the driveway at the property line with elevation for each drive.
2. Private streets should be treated as if they were driveways, and the sidewalk area should be honored with no curb extending through this area.
3. Standard paving headers shall be placed at the end of all concrete slabs.
4. All concrete to be removed shall be removed either to an existing joint or a sawed joint.
5. A thirty (30) mph minimum sight distance shall be used on all crest vertical curves. Forty (40) mph minimum for major thoroughfares.

6. Standard City of Houston Type III barricades shall be placed at the end of all dead-end streets not terminating in a cul-de-sac and other locations where applicable.
7. Street Name Signs: Prior to final acceptance of the improvements, the owner of the development must furnish and install the street name signs for all intersections. The street name signs shall be standard City of Houston type.
8. Approval of all affected agencies must be obtained prior to approval of County Engineer.
9. A letter of agreement approving the construction plan crossing is required when paving is placed over a transmission pipeline.
10. Horizontal dowels are required when meeting concrete pavement that has no exposed steel.
 - 10.1 Dowels should be #6 bars, twenty four (24") long, twenty-four inches (24") center to center, embedded twelve inches (12") and epoxied.
 - 10.2 As an alternate to 10.1 above, saw cut and remove existing concrete to expose a minimum of twelve inches (12") of steel (longitudinal to the new construction) with an equivalent cross section area of steel equal to the proposed pavement steel.
11. Dead-end streets designed to be extended in the future shall have fifteen inches (15") of reinforcing steel exposed beyond the pavement, coated with asphalt and wrapped with burlap for future pavement tie.
12. Guidelines set forth in the Manual on Uniform Traffic Control Devices shall be strictly followed.
13. "Cold" joints are not allowed.
14. When any of the roads or streets of a subdivision or re-subdivision are constructed over, across or along any existing oil, gas, sulphur, chemical or other pipeline running through the subdivision or re-subdivision, such pipeline shall be lowered and cased in such a manner as to meet the minimum requirements and conditions for pipeline crossings of County roads as established in the order of the pipeline running through the subdivision or re-subdivision, such pipeline shall be lowered and cased in such a manner as to meet the minimum

requirements and conditions for pipeline crossings of County roads as established in the order of the Commissioners' Court dated the 3rd day of May, 1956, and recorded in Volume 36 at Page 249 of the Minutes of the Commissioners' Court Order dated May 12, 1977 and recorded in Volume 95, Page 328, or any amendment thereof.

15. Road rights-of-way shall be staked with three fourths inch ($3/4$ ") iron rods at all P.C.'s, P.T.'s, block corners and dead end streets prior to acceptance of the improvements. Lot corners may be staked with minimum five eighths inch ($5/8$ ") iron rods (or other suitable metal pipes).

SECTION V
STRUCTURES

STRUCTURES

- A. Bridges or other ditch type crossings may be required in order to maintain a smooth flow of vehicular traffic through any given area.

In the event uncertainty exists concerning whether or not a bridge will be required, it is advisable to contact the County Engineer regarding same so that the issue can be resolved while the project is in the planning stage.

- B. All bridges and box culverts to be designed to minimum H20 or HS-20 as applicable load design.

- C. Bridge Widths:

1. Where there are no curbs on approach pavement, the width of bridge face to face of curbs to be out to out distance of approach road pavement edges plus two feet (2') each side, plus walk or walks.
2. Where curbs are on approach pavement, the width of bridge face to face of curbs to be same as the distance between curb faces on the approach road.
3. Individual one way traffic bridges on esplanade boulevards shall have one walk on the outside and two way traffic bridges shall have a walk on each side.
4. Bridges of widths covered by condition (1) above are to have four feet (4') clear width sidewalks.

Bridges of widths covered by condition (2) above are to have six feet (6') clear width sidewalks.

- D. All bridges to be of reinforced concrete design unless specific application require other materials and then only at the approval of the County Engineer.
- E. Bridge railings to be of galvanized or stainless steel on reinforced concrete parapet wall.
- F. Galvanized Flex Beam Guard Rails shall be designed and constructed in accordance with Harris County Engineering Department drawing titled "Flex Beam Guard Rail Detail".
- G. Design and construction shall be in conformance with Harris County Specification Item 420, "Concrete Structures" and all other applicable Harris County Specification Items.
- H. Where culverts are used, the headwall shall be of sufficient height to allow construction of the guardrail and sidewalk at the elevation of the roadway.

SECTION VI

INSPECTION

INSPECTION

- A. Developer or his/her engineer will notify the County Engineer's Office and Harris County Flood Control District by letter as to when construction of improvements is to begin. Contractor shall provide a minimum of twenty-four (24) hours advance notice to County Engineer, of each day's construction. Failure to do so may result in rejection, by County, for acceptance and maintenance.
1. To insure conformance with the final subdivision plat and drawings as approved by the Commissioners' Court, a representative of the County Engineer will inspect the subdivision during construction and after construction is completed. Harris County Flood Control District may monitor construction related to their jurisdiction.
 2. The Inspectors, under the direct supervision of the Flood Control Engineer and the County Engineer will report their findings and note variations from the approved drawings. If the developer fails to correct these variations, the subdivision may not be accepted by the Commissioners' Court of Harris County.
- B. Construction of improvements by a developer shall be conducted under the observation of a professional engineer to insure that the work is performed in accordance with the approved drawings. Work will also be monitored by the following:
1. A qualified resident Inspector furnished by the Professional Engineer,
 2. A recognized laboratory acceptable to Harris County employed by the Professional Engineer, whose representative(s) and technicians shall be NICET certified, Level II minimum.
 3. An Inspector representing Harris County.

SECTION VII
TESTING REQUIREMENTS

TESTING REQUIREMENTS

Note: A recognized laboratory, referenced throughout these specifications, means that the laboratory must be accredited by the American Association for Laboratory Accreditation (A2LA) in the field of construction materials testing.

A. General

1. Construction materials and operations shall be under controlled testing and inspection by a recognized laboratory in accordance with provisions set forth herein as well as all other applicable Harris County Specification Items and ASTM Standards. All laboratory personnel shall be NICET approved and certified, Level II minimum.
2. Upon completion of the work and prior to acceptance of the work by Harris County, the recognized laboratory shall submit, to the County Engineer, a written, certification sealed by a Professional Engineer registered in the state of Texas, that all construction materials and operations as specified above were under controlled testing and inspection by the laboratory and same complies with all specifications applicable to the project.
3. Testing of materials used for bedding and backfill of storm sewers as well as other utilities, when located underneath or within one (1) foot of subgrade shall be conducted to insure compliance with City of Houston E-14-62 and other provisions contained in Section III "Drainage Design Requirements" (General).

B. Testing Requirements for Flexible Base Pavement

Thickness of flexible base pavement shall conform to requirements given in Section IV-C.

1. Subgrade

- 1.1 Densities shall be made on each three hundred linear feet or less as conditions may require. Preparation shall be in accordance with procedures and methods specified in the applicable Harris County Specification item. 95% Standard Proctor density (ASTM D698) shall be uniformly achieved.

- 1.2 In the event of rainwater standing on the subgrade after densities are made, or other conditions beyond Contractor's control, additional densities as specified above will be required prior to progressing with the work.
- 1.3 In no case shall there be less than three (3) density tests made for each day's activity and there shall be a minimum of three (3) density tests made for each street, unless approved otherwise by resident inspector.
- 1.4 The Contractor is required to have subgrade density test reports in his/her possession at the construction site at the time of placement of base material. Date of same shall be clearly marked.

2. Base Materials

Approved base material shall be spread and uniformly compacted to 95% Standard Proctor density (ASTM D698) prior to commencing surfacing. Quantity of test(s) in accordance with above.

3. Surfacing

Surfacing shall proceed in accordance with Section IV-C 2.3 "Paving Design Requirements".

4. Roadway section shall conform to provisions contained in Section IV-C 4.2 "Paving Design Requirements".
5. All applicable portions of VII-B 1.2 and 3 contained in this section shall be strictly followed without exception.

C. Testing Requirements for Concrete Pavement

1. Subgrade

- 1.1 Densities shall be made on each three hundred (300) linear feet or less as conditions may require. Preparation of the subgrade shall be in accordance with applicable Harris County specification item. A minimum of 95% Standard Proctor density (ASTM D698) shall be uniformly achieved.
- 1.2 In the event of excessive rain water standing on the subgrade after densities are made and before concrete is placed on the prepared subgrade, or

other conditions beyond Contractor's control, additional densities as specified above will be required prior to placement of the concrete.

1.3 In no case shall there be less than three (3) density tests made for each day's activity and there shall be a minimum of three (3) density tests made for each street, unless otherwise approved by the resident inspector.

1.4 The Contractor is required to have density test reports in his/her possession at the construction site prior to placement of concrete. Date of same shall be clearly marked.

2. Concrete Test Requirements (General)

2.1 The testing laboratory shall review the mix design for each project utilizing criteria regarding cement content set forth in Section IV "Paving Design Requirements". Proportioning of concrete shall be in accordance with all applicable portions of the Item "Concrete Pavement" (Harris County Specification Item 360).

2.2 Unless otherwise permitted, the concrete mix design shall be proportioned to provide a slump of $4.50 \pm 1/2$ -inch, when tested in accordance with ASTM C143, "Slump Test". A slump test will be made for each new concrete load or when consistency of the mix changes, at the point of discharge.

2.3 The laboratory shall inspect and confirm batch design proportions at the plant site each day prior to placement of that day's concrete.

2.4 Pavement mix designs shall meet flexural strength requirements of five hundred (500) psi at seven (7) days for 5.0 sack concrete in accordance with ASTM C293.

3. Testing Requirements (Concrete Beams)

3.1 A minimum of four (4) test beams shall be made for each seven hundred fifty (750) square yards, or less, of pavement placed each day. Samples to be taken in accordance with ASTM C172 and molded and cured in accordance with ASTM C31. Any deviations from these requirements shall be recorded on the test report.

3.2 Test specimens in accordance with "Standard Test Method for Flexural Strength of Concrete" (ASTM C293).

Two specimens shall be tested at 7 days and two shall be tested at 28 days. The acceptance test results shall be the average of the strengths of the two specimens tested at 7 or 28 days. If one specimen in a test manifests evidence of improper sampling, handling, molding or testing, it shall be discarded and the strength of the remaining specimens shall be considered the test result. Should both specimens in a test show any of the above defects, the entire test shall be discarded and beams sawed from the area in question may be required by Harris County in accordance with "Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete" (ASTM C42). If the average seven day break and the twenty eight (28) day breaks do not meet minimum requirement, even though evidence of improper procedures as outlined above are not apparent, the County Engineer may, again, require sawed beams from area in question in accordance with ASTM C42.

3.3 In the event low strength concrete is confirmed, pavement in the area in question will not be accepted.

3.4 Additional beams may be required due to concrete placing conditions, or for adequately determining the strength of concrete when the early opening of the pavement to traffic is necessary and/or desirable. See Harris County specification item 360, "Concrete Pavement".

4. Concrete Test Requirements (Cores)

4.1 After the pavement has been in place for a minimum of fourteen days, one (1) core shall be taken for each 1000 square yards of pavement, or portions thereof, except that not less than one (1) core shall be taken on each street. Cores shall be taken alternately in each one-half section of the pavement in order to obtain a representative sample for thickness. Location of cores shall be selected by the Resident Inspector.

Paving Thickness: Pavement thicknesses contained herein and in the Pavement Design Section (Section IV-B, 1, 2, 3 and 5) are minimums. Therefore,

there should not be a need for any tolerance for pavement that is too thin, or less than plan requirements. However, in the event pavement the thickness of which is less than plan requirements is determined, the following shall apply:

The thickness of individual cores shall be determined in accordance with ASTM C174 by averaging no less than three (3) such measurements. Any core, the thickness of which is equal to or greater than one-quarter-inch (1/4") less than the thickness shown on the approved drawings shall be considered one of deficient thickness. Cores drilled for thickness measurements shall be a minimum of four inches (4") in diameter.

If a core is determined to be deficient in thickness, additional cores shall be taken at ten-foot (10') intervals on either side of the deficient core to establish the length of the deficient section. The length of the deficient section shall be the distance between the nearest cores of satisfactory thickness, and the width shall be the entire width of the pavement. That pavement shall be removed and replaced with concrete that meets or exceeds requirements. This shall be done at no cost to Harris County.

Other testing requirements and procedures will be given under the Section titled "Testing Requirements".

Defective Concrete. Any defective concrete discovered, after the forms have been removed, shall be removed immediately and replaced. If the surface of the concrete is bulged, uneven or shows excessive honeycombing or form marks, which in the opinion of the Engineer and the County Engineer cannot be repaired satisfactorily, the entire section shall be removed or renewed in a manner which is satisfactory to Harris County.

- 4.2 Cores shall be broken at 28 days in accordance with ASTM C42. A minimum compressive strength of 3000 psi for 5.0 sack concrete is required.

Thickness shall conform to minimum requirements contained in Section IV-B, subsection 1, 2, 3 and 5.

- 4.3 If a core fails to meet minimum strength requirements, additional cores may be required by the County Engineer and tested in accordance with procedures outlined above (ASTM C42).

In the event low strength concrete is confirmed, pavement in the area in question will not be accepted.

In the event minimum thickness is not attained, pavement will not be accepted.

D. Testing Requirements (Structures)

1. Bridges and box culvert testing shall be in accordance with Harris County Specification Item 421 "Concrete for Structures", and others as they apply.

E. Copies of all test reports to be submitted to the County Engineer in an expeditious manner.

SECTION VIII

ACCEPTANCE OF IMPROVEMENTS WITHIN SUBDIVISIONS

ACCEPTANCE OF IMPROVEMENTS WITHIN SUBDIVISIONS

A. At the time pavement and drainage facilities have been completed, the following documents shall be submitted to the County Engineer on behalf of the owner/developer by the Professional Engineer who received County Engineer approval of drawings for construction of the improvements.

1. The subdivision plat and required right-of-way or easement instruments shall have been recorded in the Official Public Records of Harris County and copies submitted to and made part of the Subdivision file to be maintained by the County Engineer. Five (5) prints and one (1) sepia of the recorded plat shall be provided.
2. One (1) microfiche jacket of microfilm images of complete "record" construction drawings shall be provided and shall become a part of the permanent file to be maintained by the County Engineer. The following information shall be added to the reproducible original drawings approved by the County Engineer.
 - 2.1 Crown and gutter line elevations of the roadway, flow line elevations and grade of all inlets and storm sewers shall be shown. Each original drawing shall be stamped as a "Record Drawing".

EXAMPLE

Drawings, as approved
prior to construction

T.C. = 101.50

flowline = 94.50

Record drawings,
subsequent to
construction

T.C. = 101.50

101.49
G 100.89

flowline = 94.50

94.52

- 2.2 Top elevations of storm sewer manholes as well as all crude oil, gas and product pipelines shall be shown. Technique shall be similar to that prescribed above.
3. A letter signed and sealed by the Professional Engineer certifying that the elevations and grades were taken by an on-site survey on a certain date and that all pavement, inlets, manholes and appurtenances are

constructed to grade as shown on the record drawings and in compliance to specifications. The letter shall also certify that all trunk storm sewers, and leads are of the proper size and that all improvements are capable of performance as designed and approved. Any deviations from the approved construction drawings to actual construction shall be noted for evaluation by the County Engineer.

4. A letter from the Harris County Flood Control District certifying that the drainage facilities are constructed in accordance with approved drawings.
 5. Certification letter from the recognized laboratory as described in Section VII-A, 2, "Testing Requirements, Sub-Section B, as well as copies of testing results as specified in Section VII-A, 2.
 6. Construction costs for the pavement and drainage improvements.
 7. A letter from the Professional Engineer requesting acceptance of the improvements.
- B. Upon receipt of the above listed documentation, the County Engineer or designated representative(s) shall complete review of the material and an on-site inspection shall be scheduled.
1. At the time of inspection, should any deficiencies be found, the County Engineer shall notify the applicant, in writing, of the deficiencies requiring correction. Reinspection by the County Engineer will be made following receipt of a letter from the Professional Engineer stating that all noted deficiencies have been corrected. If more than three months have passed since the date of the first deficiency report released by the County Engineer, the project is subject to a complete reinspection and all noted deficiencies found at that time shall be identified and reported to the Professional Engineer for correction.

2. At the time all corrective work is completed and the County Engineer has found the streets and drainage improvements to meet the Harris County Road Law and rules and regulations adopted by Harris County Commissioners' Court, the County Engineer shall recommend acceptance of those certain road, street and drainage improvements. This recommendation is transmitted to the Harris County Right of Way Department.
3. The Right of Way Department shall perform such action necessary to have the roads placed on the Road Log and shall issue a letter stating same.

C. Bond

1. The County Engineer or designated representative(s) shall inspect these road, street and drainage improvements on or before one (1) year after the date of the Right-of-Way Department letter covered in B.3 (above).
2. At the time of inspection, should any deficiencies be found, the County Engineer shall notify the owner/developer as principal on the bond, in writing, of the deficiencies requiring correction. Reinspection by the County Engineer will be made following receipt of a letter from the Professional Engineer stating that all noted deficiencies have been corrected. If more than three months have passed since the date of the first deficiency report released by the County Engineer, the project is subject to a complete reinspection and all noted deficiencies found at that time shall be identified and reported to the Professional Engineer for correction.
3. At the time all corrective work is completed and the County Engineer has found the streets and drainage improvements to meet the Harris County Road Law and rules and regulations adopted by Harris County Commissioners' Court, the County Engineer shall recommend to Commissioners' Court that the bond be terminated. Upon action by Commissioners' Court, the County Engineer, by letter, will transmit a copy of the Court Order terminating the bond to all concerned parties.

SECTION IX

MISCELLANEOUS REQUIREMENTS

MISCELLANEOUS REQUIREMENTS

A. Site drawings where no "public" streets are to be constructed

1. All applicable requirements contained in these rules, regulations and requirements shall be strictly followed.
2. Requirements of Permit Division of Harris County Engineering Department shall be met. County Engineer approval of drainage plans must be obtained prior to issuance of any and all required permits.
3. On curb and gutter streets with storm sewers, a one hundred and fifty (150) foot strip of land, or equivalent, adjacent to the right-of-way will be allowed to sheet flow to the street. Any storm water originating outside this strip shall be collected in an underground system prior to discharging into the public storm sewer system. Approvals for drainage to roadside ditches shall be on an individual basis.
4. Location of driveways and/or private access roads shall be on an individual basis.

Driveways and sidewalks shall conform to Harris County Standard Drawing S/D-2C as well as Regulations of Harris County for the Construction of Driveways and Culverts on County Easements and Rights-of-Way.

5. Improvements proposed which alter the integrity of existing Harris County Facilities, or construction of improvements proposed which will hinder maintenance operations on County Facilities will be reviewed on an individual basis.

B. Utilities located within existing Harris County right-of-way

1. Review and approval on any such proposal shall be conducted on an individual basis, and all applicable requirements contained in these rules, regulations and requirements shall be strictly followed.
2. Requirements of Permit Division of Harris County Engineering Department shall be met. County Engineer approval of drawings must be obtained prior to issuance of any and all required permits.
3. Utilities shall be located in such a manner that, conflicts with existing, proposed and future improvements are avoided. Care shall also be taken so that maintenance operations of County facilities are not hindered.